

**WEST**

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L8: Entry 82 of 129

File: DWPI

Nov 5, 1998

DERWENT-ACC-NO: 1992-142888

DERWENT-WEEK: 199850

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TITLE: On-line reconstruction of RAID 5 disc array system -  
replacing faulty disc and reconstructing data stripe by stripe  
using data from remaining discs whilst supporting access to areas  
being reconstructed

INVENTOR: STALLMO, D C

## PRIORITY-DATA:

1990US-0601912

October 23, 1990

1993US-0017826

February 16, 1993

## PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
DE 69130279 E	November 5, 1998	N/A	000	G06F011/10
EP 482819 A	April 29, 1992	E	016	N/A
AU 9185904 A	May 7, 1992	N/A	000	G06F011/00
CA 2053692 A	April 24, 1992	N/A	000	G06F011/16
US 5208813 A	May 4, 1993	N/A	014	G06F011/20
EP 482819 A3	January 13, 1993	N/A	000	N/A
US 5390187 A	February 14, 1995	N/A	000	G06F011/10
EP 482819 B1	September 30, 1998	E	000	G06F011/10

INT-CL (IPC): G06F 11/00; G06F 11/10; G06F 11/14; G06F 11/16;  
G06F 11/20

ABSTRACTED-PUB-NO: EP 482819A

## BASIC-ABSTRACT:

The computer system uses a RAID 5 construction with 5 disks (S1-S5) viewed as stripes (A-H) having parity blocks (circled items) spread through the disks. When a disk fails (2b) it is logically or physically replaced by a new disk (2c) and then reconstructed stripe by stripe (2d) by using the data from the other 4 disks in the stripe to reconstruct the data for the replacement disk until it is completely rebuilt (2e). If a read operation is requested by the CPU during reconstruction, the requested block is rebuilt as above, or supplied from the reconstructed area.

USE/ADVANTAGE - Provides on-line reconstruction of a RAID 5 system.

ABSTRACTED-PUB-NO:

EP 482819B EQUIVALENT-ABSTRACTS:

The computer system uses a RAID 5 construction with 5 disks (S1-S5) viewed as stripes (A-H) having parity blocks (circled items) spread through the disks. When a disk fails (2b) it is logically or physically replaced by a new disk (2c) and then reconstructed stripe by stripe (2d) by using the data from the other 4 disks in the stripe to reconstruct the data for the replacement disk until it is completely rebuilt (2e). If a read operation is requested by the CPU during reconstruction, the requested block is rebuilt as above, or supplied from the reconstructe d area.

USE/ADVANTAGE - Provides on-line reconstruction of a RAID 5 system.

US 5208813A

After providing a replacement storage unit for the failed storage unit, reconstruction begins for each data stripe in the array. General reconstruction consists of applying an error-correction operation (such as an XOR operation on data blocks and a corresponding parity block) to the data blocks from the remaining storage unit in the redundancy group, and storing the result in the corresponding block of the replacement storage unit.

If a Read operation is requested by the CPU for a data block on the replacement storage unit, then a concurrent Read task is executed which reconstructs the stripe containing the requested data block. If a Read operation is requested by the CPU for a data block not on the replacement storage unit, a concurrent Read task is executed which performs a normal Read. If a Write operation is requested for any data block, then a concurrent Write task is executed which performs a Read-Modify-Write sequence in the generatal case (the Read operation being performed in accordance with the above rules).

USE - On-line resonstruction of failed storage unit in redundant array system.

US 5390187A

After providing a replacement storage unit for the failed storage unit, reconstruction begins for each data stripe in the array. General reconstruction consists of applying an error-correction operation (such as an XOR operation on data blocks and a corresponding parity block) to the data blocks from the remaining storage units in the redundancy group, and storing the result in the corresponding block of the replacement storage unit. If a Read operation is requested by the CPU for a data block on the replacement storage unit, then a concurrent Read task is executed which reconstructs the stripe containing the requested data block.

If a Read operation is requested by the CPU for a data block not on the replacement storage unit, a concurrent Read task is executed which performs a normal Read. If a Write operation is requested for any data block, then a concurrent Write task is executed which performs a Read-Modify-Write sequence in the general case (the Read operation being performed in accordance with the above rules). (ATF in week 9512/ Printed in week 9513)

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L8: Entry 4 of 129

File: DWPI

Dec 7, 1999

DERWENT-ACC-NO: 2000-071573

DERWENT-WEEK: 200006

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TITLE: Storage data reconstruction system in disc array system

INVENTOR: KAKUTA, H; KAMO, Y ; TANAKA, A

PRIORITY-DATA:

1991JP-0094728

April 1, 1991

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 6000039 A	December 7, 1999	N/A	015	G06F011/00

INT-CL (IPC): G06F 11/00; G06F 11/30

ABSTRACTED-PUB-NO: US 6000039A

BASIC-ABSTRACT:

NOVELTY - Control circuit (150) controls data correcting unit to execute operation of data correcting unit before accessing of data storage units, when redundancy is less than predefined value and to execute accessing of data storage unit before operation of data correcting unit, when redundancy is not less than predefined value.

DETAILED DESCRIPTION - The data correcting unit corrects the data having error in any of data storage units by using error correction data read out from data storage unit and not by using the specified data in the data groups read out from the data storage units. The corrected data is stored in data storage units. The redundancy judgment unit decides redundancy of data storage units in response to the monitored results indicating failure occurred in data storage unit. An INDEPENDENT CLAIM is also included for storage data reconstruction method.

USE - For data reconstruction in disk array system e.g. for magnetic disk, optical disk, floppy disk or semiconductor memory array system.

ADVANTAGE - The frequency of data reconstruction processing or ratio of amount of data reconstruction within unit time, is set according to magnitude of frequency of processing of normal access or read-write, thereby reconstruction processing can be

carried out efficiently in time aspect. When number of storage units at fault is less than redundancy of memory, processing of access or read/write takes place precedence over the data reconstruction processing, thereby load of memory is not increased so that it is possible to reduce degradation of response performance of memory. Since when the remaining redundancy becomes small, processing of accessing of data storage unit is stopped automatically, thereby increasing reliability of memory.

DESCRIPTION OF DRAWING(S) - The figure shows block diagram of memory.

Control circuit 150

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L8: Entry 75 of 129

File: DWPI

Sep 1, 1998

DERWENT-ACC-NO: 1993-160570

DERWENT-WEEK: 199842

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TITLE: Storage array system with data reconstruction - uses several stores, with one spare for replacing failed store, and control for transferring data to and from array.

INVENTOR: CHEN, J; LAU, K

PRIORITY-DATA:

1991US-0792729

November 15, 1991

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 5802264 A	September 1, 1998	N/A	000	G06F011/00
EP 541992 A2	May 19, 1993	E	022	G06F011/00
EP 541992 A3	July 6, 1994	N/A	000	G06F011/00
EP 541992 B1	April 29, 1998	E	029	G06F011/00
DE 69225296 E	June 4, 1998	N/A	000	G06F011/00

INT-CL (IPC): G06F 11/00; G06F 11/14; G06F 11/20

ABSTRACTED-PUB-NO: EP 541992A

BASIC-ABSTRACT:

The array system (24) comprises a number of stores (32), a spare store (36), and a controller (26 and 28). Each of the stores can be in an operable state, in which data transfers can occur, or in a failed state in which data transfers are inhibited or hindered. The spare store is used to replace any store that has failed.

Data are distributed throughout the array and the controller controls transfers of data to and from the array. The controller includes a reconstruction unit for use in reconstructing, on the spare store, data contained in the first failed store, and a transfer unit for use in conducting a data transfer during data reconstruction.

ADVANTAGE - Enables data transfers between array and host to be carried out while data reconstruction is taking place in another part of array.

ABSTRACTED-PUB-NO:

## EP 541992B EQUIVALENT-ABSTRACTS:

The array system (24) comprises a number of stores (32), a spare store (36), and a controller (26 and 28). Each of the stores can be in an operable state, in which data transfers can occur, or in a failed state in which data transfers are inhibited or hindered. The spare store is used to replace any store that has failed.

Data are distributed throughout the array and the controller controls transfers of data to and from the array. The controller includes a reconstruction unit for use in reconstructing, on the spare store, data contained in the first failed store, and a transfer unit for use in conducting a data transfer during data reconstruction.

ADVANTAGE - Enables data transfers between array and host to be carried out while data reconstruction is taking place in another part of array.

US 5802264A

The array system (24) comprises a number of stores (32), a spare store (36), and a controller (26 and 28). Each of the stores can be in an operable state, in which data transfers can occur, or in a failed state in which data transfers are inhibited or hindered. The spare store is used to replace any store that has failed.

Data are distributed throughout the array and the controller controls transfers of data to and from the array. The controller includes a reconstruction unit for use in reconstructing, on the spare store, data contained in the first failed store, and a transfer unit for use in conducting a data transfer during data reconstruction.

ADVANTAGE - Enables data transfers between array and host to be carried out while data reconstruction is taking place in another part of array.

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L13: Entry 45 of 102

File: DWPI

Jul 21, 1998

DERWENT-ACC-NO: 1997-065597

DERWENT-WEEK: 199839

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TITLE: Data reconstruction method for hard disc data storage system - reading parity data from storage device, reconstructing data from defective storage by logical operation, and replacing by reconstructed data

INVENTOR: IWASA, H

PRIORITY-DATA:

1995WO-JP01157

June 8, 1995

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 09502881 X	July 21, 1998	N/A	000	G11B020/18
WO 9642083 A1	December 27, 1996	J	027	G11B020/18
EP 831484/ A1	March 25, 1998	E	012	G11B020/18

INT-CL (IPC): G11B 20/18

ABSTRACTED-PUB-NO: WO 9642083A

BASIC-ABSTRACT:

If one of a number of data storages in a system is out of order, the data in the defective storage are reconstructed on the basis of data in the other storages. The data reconstruction method involves reading out data from data storages, reading out parity data from a data storage storing the parity data, and reconstructing data stored in the defective storage by executing a logical operation between the data and the parity data.

The parity data stored in the storage are then replaced by reconstructed data.

ADVANTAGE - Prevents degradation of performance in data reconstruction and eliminates the necessity for additional redundant data storages.

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L7: Entry 29 of 73

File: DWPI

Feb 27, 1996

DERWENT-ACC-NO: 1996-139321

DERWENT-WEEK: 200006

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TITLE: Data reconstruction method after failure for access or read-write in parallel with independent storage units - detects failure using error check, discriminates failure selects processing for failure from normal access or read-write

INVENTOR: KAKUTA, H; KAMO, Y ; TANAKA, A

## PRIORITY-DATA:

1991JP-0094728

April 1, 1991

1998JP-0104185

April 1, 1991

1998JP-0104186

April 1, 1991

## PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 5495572 A	February 27, 1996	N/A	016	G06F011/00
JP 11119920 A	April 30, 1999	N/A	012	G06F003/06
JP 11119921 A	April 30, 1999	N/A	011	G06F003/06

INT-CL (IPC): G06F 3/06; G06F 11/00; G06F 11/30

ABSTRACTED-PUB-NO: US 5495572A

## BASIC-ABSTRACT:

The storage data reconstruction system includes storage units for storing divided data units for storing ECC data corresponding to the divided data. A spare storage unit for storing reconstructed data. An I-O-reconstruction control circuit, a timer, a data reconstructing table for a storage unit which has failed and a circuit for reconstructing faulty data are provided.

When a failure occurs in any of the storage units, the failure is detected by an error check, a state of the failure is discriminated, a preferred processing suitable for the state of the failure is selected from a processing of a normal access or read-write, and a data reconstruction processing, and the selected processing is carried out, or the frequency of the processing of the normal access or read-write and the data reconstruction processing, or the ratio of the amount of the data reconstruction processing within a unit time, is set. The time taken to reconstruct the faulty data does not exceed a fixed period of time.

period of time.

ADVANTAGE - Minimises reduction of processing of normal access or read-write in failure, limits time required for repair of failure within fixed time and ensures high reliability, w.r.t. memory which has redundancy for failure of two or more storage.

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L7: Entry 5 of 73

File: DWPI

Mar 30, 1999

DERWENT-ACC-NO: 1999-243441

DERWENT-WEEK: 200006

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TITLE: Data reconstruction system for storage units

INVENTOR: KAKUTA, H; KAMO, Y ; TANAKA, A

PRIORITY-DATA:

1991JP-0094728

April 1, 1991

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 5889938 A	March 30, 1999	N/A	014	G06F011/00

INT-CL (IPC): G06F 11/00; G06F 11/30

ABSTRACTED-PUB-NO: US 5889938A

BASIC-ABSTRACT:

NOVELTY - When a fault occurs in any one of disks (158,160,162,164,166,168- ), the information is stored in data reconstructing table (154), based on error correcting data in the disks. An I/O reconstruction control circuit (150), upon detection of a failure, discriminates the state of failure and selects either processing of normal access or data reconstruction processing.

DETAILED DESCRIPTION - When data reconstruction is completed, memory returns to normal state, otherwise interruption is canceled and reconstruction process is carried on until all data are reconstructed.

USE - For storage units e.g. magnetic disk, optical disk, floppy disk or semiconductor memory.

ADVANTAGE - Reduction in processing performance of normal access and high reliability is ensured due to application of data reconstruction upon detection of failure. Data reconstruction is carried out effectively since frequency of data reconstruction processing is set to according to that of normal access.

DESCRIPTION OF DRAWING(S) - The figure shows block diagram of arrangement of memory for data reconstruction.

I/O reconstruction control circuit 150

I/O reconstruction control circuit 150

Data reconstructing table 154

Storage disks 158,160,162,164,166,168